

What is claimed is:

1 1. A data storage apparatus comprising:
2 at least one of a plurality of storage media;
3 a cache memory;
4 a controller operable to move data into and out of said at least one of a
5 plurality of storage media and said cache memory; said controller further operable to
6 receive data from an external source for storage; and
7 a hazard sensor; wherein
8 responsive to said hazard sensor detecting a probable occurrence of a
9 hazardous event, said controller copies data from said cache memory to said at least one
10 of a plurality of storage media.

1 2. A data storage apparatus comprising:
2 at least one of a plurality of storage media;
3 a cache memory;
4 a controller operable to move data into and out of said at least one of a
5 plurality of storage media and said cache memory; said controller further operable to
6 receive data from an external source for storage; and
7 a hazard sensor; wherein
8 responsive to said hazard sensor detecting a probable occurrence of a
9 hazardous event, said controller copies data from said cache memory to said at least one
10 of a plurality of storage media, and said controller receiving data from said external
11 source delays sending an acknowledgment to said external source until said data is copied
12 into said at least one of a plurality of storage media.

1 3. The data storage apparatus of claim 2, wherein:
2 responsive to said hazard sensor determining that a hazardous event is no
3 longer probable, said controller receiving data from said external source sends an
4 acknowledgment to said external source prior to copying said data into said at least one of
5 a plurality of storage media.

1 4. A data storage apparatus comprising:
2 at least one of a plurality of storage media;
3 a cache memory;

4 a controller operable to move data into and out of said at least one of a
 5 plurality of storage media and said cache memory; said controller further operable to
 6 receive data from an external source for storage; and
 7 a hazard sensor; wherein
 8 responsive to said hazard sensor detecting a probable occurrence of a
 9 hazardous event, said controller copies data from said cache memory to said at least one
 10 of a plurality of storage media, and said controller receiving data from said external
 11 source for storage is temporarily suspended while said controller copying said data from
 12 said cache memory to said at least one of a plurality of storage media is performed.

1 5. A data storage apparatus comprising:
 2 at least one of a plurality of storage media;
 3 a cache memory;
 4 a controller operable to move data into and out of said at least one of a
 5 plurality of storage media and said cache memory; said controller further operable to
 6 receive data from an external source for storage; and
 7 a hazard sensor; wherein
 8 responsive to said hazard sensor detecting a probable occurrence of a
 9 hazardous event, said controller copies data from said cache memory to said at least one
 10 of a plurality of storage media, and said controller copying said data from said cache
 11 memory to said at least one of a plurality of storage media is performed with a higher
 12 priority than said controller receiving data from said external source for storage.

1 6. A data storage apparatus comprising:
 2 at least one of a plurality of storage media;
 3 a cache memory;
 4 a controller operable to move data into and out of said at least one of a
 5 plurality of storage media and said cache memory; said controller further operable to
 6 receive data from an external source for storage; and
 7 a hazard sensor; and
 8 a link to a remotable storage system; wherein
 9 responsive to said hazard sensor detecting a probable occurrence of a
 10 hazardous event, said controller copies data from said cache memory to said at least one
 11 of a plurality of storage media, and wherein

12 said controller copying data from said cache memory further comprises
13 said controller copying said data over said link to said removable storage system.

1 7. The data storage apparatus of claim 6, wherein said controller
2 responsive to said hazard sensor detecting a probable occurrence of a hazardous event,
3 copying said data over said link to said removable storage system is performed with a
4 higher priority than said controller copying data from said cache memory to said at least
5 one of a plurality of storage media.

1 8. The data storage apparatus of claim 6, wherein said controller
2 responsive to said hazard sensor detecting a probable occurrence of a hazardous event,
3 copying data from said cache memory to said at least one of a plurality of storage media
4 is performed with a higher priority than said controller copying said data over said link to
5 said removable storage system.

1 9. A data storage apparatus comprising:
2 at least one of a plurality of storage media;
3 a cache memory;
4 a controller operable to move data into and out of said at least one of a
5 plurality of storage media and said cache memory; said controller further operable to
6 receive data from an external source for storage; and
7 a hazard sensor; and
8 a link to a removable storage system; wherein
9 responsive to said hazard sensor detecting a probable occurrence of a
10 hazardous event, said controller copies data from said cache memory to said at least one
11 of a plurality of storage media, and said controller copying data from said cache memory
12 further comprises said controller copying said data over said link to said removable
13 storage system, wherein
14 said controller copying said data over said link to said removable storage
15 system is performed asynchronously, until, responsive to said hazard sensor detecting a
16 probable occurrence of a hazardous event, said controller performs said copying of said
17 data over said link to said removable storage system synchronously.

1 10. The data storage apparatus of claim 9, wherein

2 responsive to said hazard sensor determining that a hazardous event is no
 3 longer probable, said controller switches from copying said data over said link to said
 4 remotable storage system synchronously to copying said data over said link to said
 5 remotable storage system asynchronously.

1 11. The data storage apparatus of claim 1, wherein:
 2 said hazard sensor detecting a probable occurrence of a hazardous event
 3 includes at least one of: operation of a seismograph, recognition of an indicator of a fire,
 4 operation of a smoke sensor, detection of voltage fluctuation, sensing lightening,
 5 receiving public information from a meteorological agency, sensing moisture, sensing a
 6 flood and receiving external attention/warning information.

1 12. A data storage system, comprising:
 2 a first data storage system, said first data storage system further
 3 comprising:
 4 a storage device that stores data received from a computer; and
 5 a storage controller, said storage controller comprising:
 6 a memory to hold said data temporarily, and
 7 a recognition part to recognize a possibility of a hazard;
 8 a data link; and
 9 a second data storage system, connected by said data link to said first data
 10 storage system;
 11 wherein when said recognition part of said first data storage system
 12 provides a warning of a possibility of a hazard, thereupon said storage controller of said
 13 first data storage system copies data stored in said memory to said second data storage
 14 system over said data link.

1 13. The data storage system of claim 12, wherein:
 2 responsive to said recognition part of said first data storage system
 3 providing said warning of said possibility of a hazard, said storage controller of said first
 4 data storage system switches from an asynchronous copying to a synchronous copying of
 5 said data stored in said memory to said second data storage system over said data link.

1 14. The data storage system of claim 12, further comprising:

2 a third data storage system, said third data storage system having a third
3 data storage controller; and

4 a communication link connecting said third data storage controller to said
5 data storage controller of said first data storage system; and wherein:

6 when said first data storage system and said third data storage system
7 function co-operatively, said data storage controller of said first data storage system and
8 said third data storage controller communicate with each other over said communication
9 link after recognition of a hazard of losing said data.

1 15. A method for controlling a data storage system, said data storage
2 system comprising a storage controller, a storage device, and a memory, said method
3 comprising:

4 receiving from an external source a request to write data to said storage
5 device;

6 storing said data relating to said request within said memory;

7 reporting completion of said request to write to said external source;

8 copying said data held in said memory to said storage device;

9 responsive to recognizing a possibility of losing said data held in said
10 memory, copying any data remaining in said memory into said storage device prior to
11 accepting another request to write data from an external source.

1 16. A method for controlling a data storage system, said data storage
2 system comprising a storage controller, a storage device, and a memory, said method
3 comprising:

4 receiving from an external source a request to write data to said storage
5 device;

6 storing said data relating to said request within said memory;

7 copying said data held in said memory to said storage device;

8 responsive to recognizing a possibility of losing said data held in said
9 memory, delaying reporting completion of said request to write to said external source
10 until completing copying any data remaining in said memory into said storage device
11 prior to accepting another request to write data from an external source.

1 17. A method for controlling a data storage system, said data storage
2 system comprising a storage controller, a storage device, and a memory, said method
3 comprising:
4 receiving from an external source a request to write data to said storage
5 device;
6 storing said data relating to said request within said memory;
7 reporting completion of said request to write to said external source;
8 copying said data held in said memory to said storage device;
9 responsive to recognizing a possibility of losing said data held in said
10 memory, performing copying any data remaining in said memory into said storage device
11 at a higher priority to accepting another request to write data from an external source.

1 18. A control method capable of being used in a data storage system
2 that comprises a storage controller, a storage device, and a memory, said method
3 comprising:
4 receiving a request to write data to said storage device from a computer,
5 holding the data relating to said request within said memory,
6 returning a report of completion of writing to said computer,
7 copying said data held in said memory to a second data storage system,
8 recognizing a possibility of losing said held data, and
9 suspending temporarily receiving of said request to write from said
10 computer if a possibility of losing said held data is recognized.

1 19. A control method capable of being used in a data storage system
2 that comprises a storage controller, a storage device, and a memory, said method
3 comprising:
4 receiving a request to write data to said storage device from a computer,
5 holding the data relating to said request within said memory,
6 returning a report of completion of writing to said computer,
7 copying said data held in said memory to a second data storage system,
8 recognizing a possibility of losing said held data, and thereupon, if said
9 possibility of losing said held data is recognized,

performing said copying of any un-copied data held in said memory to said second data storage system prior to storing any data into said storage device.

20. A control method capable of being used in a data storage system that comprises a storage controller, a storage device, and a memory, said method comprising:

receiving a request to write data to said storage device from a computer, holding the data relating to said request within said memory, returning a report of completion of writing to said computer, copying said data held in said memory to a second data storage system, recognizing a possibility of losing said held data, and thereupon, if said possibility of losing said held data is recognized,

performing storing of any data remaining in said memory into said storage device prior to copying any un-copied data in said memory to said second data storage system.

21. A control method capable of being used in a data storage system that comprises a storage controller, a storage device, and a memory, said method comprising:

receiving a request to write data to said storage device from a computer, holding the data relating to said request to write within said memory, returning a report of completion of writing to said computer, copying said data held in said memory to a second storage system, recognizing a possibility of losing said held data,

responsive to recognition of a possibility of losing said held data, copying the data, requested to be written to said storage device by said computer, to said second storage system; and

returning a report of completion of writing to said computer.

22. A control method capable of being used in a remote copy system that comprises a primary storage system having a primary storage controller, a primary storage device, and a primary memory and a secondary storage system having a secondary storage controller, a secondary storage device, and a secondary memory, said method comprising:

6 receiving a request to write data into said primary storage device from a
7 computer,
8 holding the data relating to said request within said primary memory,
9 returning a report of completion of writing to said computer,
10 copying said data held in said primary memory to said secondary storage
11 system; and
12 recognizing a possibility of losing said held data, and responsive to
13 recognition of a possibility of losing said held data,
14 copying the data, requested to be written to said primary storage device by
15 said computer to said secondary storage device; and
16 returning a report of completion of writing to said computer.

1 23. The control method capable of being used in a remote copy system
2 of claim 22, wherein said copying the data, requested to be written to said primary storage
3 device by said computer to said secondary storage device after the recognition of a
4 possibility of losing said held data, further comprises:

5 detecting if un-copied data for said secondary storage system is remaining
6 in said primary memory,

7 holding the copy data which is transferred to said secondary storage
8 system and that is related to a new request to write by said computer if said un-copied
9 data is found, and

10 storing the data in said secondary memory to said secondary storage
11 device in order after receiving all said un-copied data by said secondary storage system.

1 24. The control method capable of being used in a remote copy system
2 of claim 22, wherein said copying the data, requested to be written to said primary storage
3 device by said computer to said secondary storage device after the recognition of a
4 possibility of losing said held data, further comprises:

5 detecting if un-copied data for said secondary storage system is remaining
6 in said primary memory,

7 copying the data, relating to the request to write by said computer, with an
8 indication for temporary holding to said secondary storage system

9 returning a report of completion of writing to said computer if said un-
10 copied data is found,

11 copying the data, relating to the request to write by said computer, with an
12 indication of end of temporary holding to said secondary storage system;
13 returning a report of completion of writing to said computer after
14 completion of copying said un-copied data,
15 in said secondary storage system, holding the data with said indication for
16 temporary holding and the data with said indication of end of temporary holding, relating
17 to said request to write by said computer, in said secondary memory, and
18 storing the data held in said secondary memory to said secondary storage
19 device in order.